

BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

VOL. LVI

APRIL, 1961

No. 2

STUDIES ON THE PLECOPTERA OF NORTH
AMERICA: VIII.¹ THE IDENTITY OF
THE SPECIES OF *PARACAPNIA*²

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During the summer of 1960 it was my good fortune and pleasure to go to Oxford in England to study the types of one of our two American species of *Paracapnia*. My pleasure was reduced, however, upon discovering that *Paracapnia curvata*, 1946, a species which I had described earlier, must fall into synonymy under *P. opis* (Newman), 1839.

The name *opsis* lay unused and the species unrecognized for ninety-nine years after the original description. After studying the types of *opsis* at Oxford, Ricker (1938) declared this species to be identical with what Needham and Claassen in their monograph (1925) called *vernalis* Newport. Apparently, Claassen had previously studied the types of *opsis* (see Ricker, 1938, p. 135) and had come to the same conclusion. However, the Needham and Claassen drawings are inadequate and Ricker made none at all. Thus, Frison in 1942 and myself later (1943, 1946) expressed some skepticism concerning the identity of the species. Frison's conviction that there was only one Eastern North American species simplified the problem in his mind, and he described and figured some Illinois specimens as *opsis*.

Since the distinctive male genital features were clearly recognizable in Frison's drawings and since it was unlikely that I would

¹ Part VII appeared in the April 1960 issue of this journal. The title was inadvertently incomplete as to part number.

² Supported by NIH Grant E-1442(C5), U. S. Public Health Service. Contribution No. 1343 from the entomological laboratory of the University of Massachusetts, Amherst, Mass.

get a chance to study the types of *opis* at Oxford in the near future, it seemed appropriate to accept his fine description so that both species of *Paracapnia* could be made available in the biological literature. Thus, in 1946 I described *P. curvata* as a new species quite different from the one figured by Frison in 1942. Unfortunately, the present study has shown his choice to have been wrong: i.e., the male type specimen of *opis* is not conspecific with the *opis* of Frison. As a result of this confusion, *P. curvata* becomes a synonym of *P. opis* and a new name must be applied to the species generally called *opis*.

To add to the confusion, my recent studies of the lectotype of *vernalis* in London have shown that this is a species of *Capnia* and not a *Paracapnia*, and thus is quite different in many details from what Needham and Claassen (1925) interpreted as *vernalis*. A study of the Needham and Claassen (1925, p. 385) drawings of the wings and genitalia of *vernalis* is convincing evidence that these authors were dealing with a *Paracapnia*, not a *Capnia*, although it is not quite clear which species of *Paracapnia* they illustrated. It is extremely probable that the published collection data under *vernalis* and *opis* represent a mixture of the two species of *Paracapnia* since these are sympatric over much of their ranges. All of the specimens studied by Needham and Claassen, Frison, and Ricker should therefore be reclassified.

It is the purpose of the present paper simply to clarify the identity of the two species of *Paracapnia*.

Paracapnia opis (Newman)

Chloroperla opis Newman, 1839, Mag. Nat. Hist. 3: 89 (♂♀ types in Hope Collection, Pitt Rivers Museum, Univ. of Oxford, England).

Capnia vernalis, Needham and Claassen, 1925, The Plecoptera or stoneflies of America North of Mexico, pp. 256-7, 2 questionable figs. of ♂♀ (in part?; not Newport, 1848).

Capnia opis, Ricker, 1938, Trans. Roy. Canad. Inst., vol. 22, pt. 1, no. 47, pp. 134-5 (in part?).

Capnia opis, Frison, 1942, Bul. Illinois Nat. Hist. Survey 22(2): 264-5 (not Newman, 1839; collection data in part).

Paracapnia curvata Hanson, 1946, Amer. Midl. Nat. 35: 237-8, fig. 53 (*New Synonymy*).

Types.—The two types at Oxford are not still in good condition. Some of the wings of both, the venation of which was described in detail by Ricker (1938), seem to have been lost. The male specimen has only the basal portion of the right front wing

remaining, and in the female the right front wing is missing. The museum attendant felt very certain that the wings are no longer in existence. The abdomens of both type specimens are mounted in balsam and affixed to the pins bearing the head and thorax. The latter are glued to a paper point, concealing critical diagnostic sternal thoracic characters. The supraanal process of the male, as was mentioned by Ricker, is damaged: it is distorted and split wide open at the basal curvature and even the remaining distal region is slightly split so that its shape is difficult to determine. The notch mentioned by Ricker in 1938 on the subgenital plate of the female is not natural. Under the high power of the stereoscope it can be seen to have a ragged edge such as might be produced by buffalo beetle feeding. Judging by the penmanship and the method of mounting, it appears that Dr. Kimmins of the British Museum prepared these fine balsam mounts to properly preserve and protect the remains.

Both specimens are from "Newfoundland." Another label on each pin is not easily read: Ricker has suggested that it is either "Weston" or "Chuston." The "Chuston" possibility seems much the more likely since it would be very difficult to interpret the first letter of the label on the female specimen as a W; and furthermore, on the male the label seems quite clearly to start with a Ch. However, I am not able to find Chuston on any maps of Newfoundland available to me.

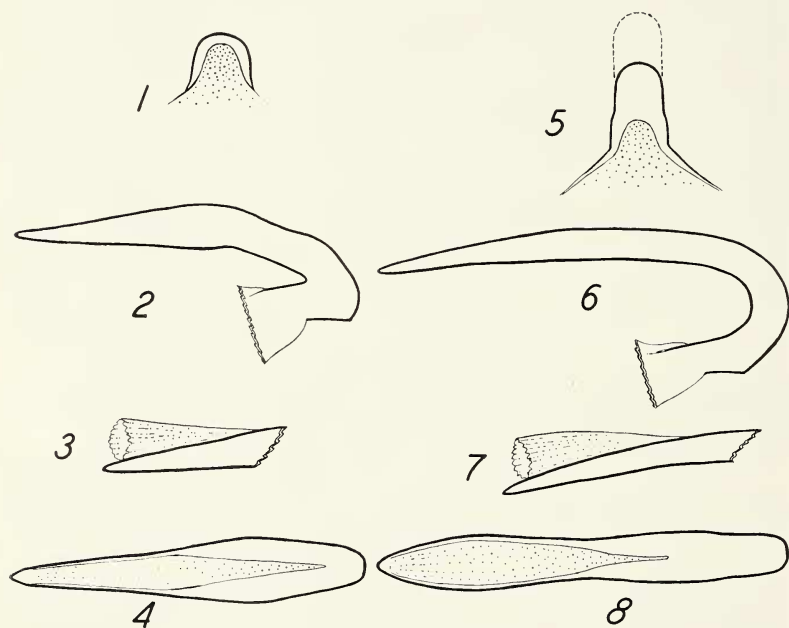
In spite of the condition of the types, I had no difficulty with the generic placement of these specimens. One of the best features for distinguishing *Capnia* from *Paracapnia* is the presence or absence respectively of a sharp curvature in the base of vein 1A of the front wing: this is visible in both specimens.

Lectotype.—Since the females of the two species of *Paracapnia* are presently indistinguishable, the male cotype of *P. opis* is here designated lectotype. It remains, of course, in the Hope Collection at Oxford.

Male.—Since the two known species of *Paracapnia* are presently distinguishable only by the structure of the supraanal process of the male, the poor condition of the lectotype presented a problem. The longer I tried to reconstruct in my mind the distorted pieces of the supraanal process the more nearly convinced I became that *opsis* was the species with the longer more curved supraanal process (Fig. 6). The problem was satisfactorily resolved, however, only when I discovered a feature which I had missed when originally distinguishing the two species (Hanson, 1946). The ventral basal part of the supraanal process of the lectotype, which is not dam-

aged, is clearly visible on the slide, and a comparison of several specimens shows a consistent difference between the two species in this region ventrally (Figs. 1 and 5). In *P. opis* the supraanal process extends much more posteriorly beyond the subanal lobes than in *P. angulata*. The narrowness of the base of the supraanal process of *opis* accentuates this appearance of greater length. Also, the membranous intrusion into the base of the supraanal process ventrally is narrower in *opis*, with much more of the supraanal process visible beyond the tip of the intrusion than is the case in *angulata*.

Further descriptive information on the male and a description of the female is contained in the original description of *P. curvata* (Hanson, 1946, pp. 236-8).



Figs. 1-4, *Paracapnia angulata*, n. sp., supraanal process. Fig. 1, Ventral view. Fig. 2, Lateral view. Fig. 3, Lateral view with seminal duct expanded and open. Fig. 4, Dorsal view. Figs. 5-8, *Paracapnia opis* (Newman), supraanal process. Fig. 5, Ventral view, with broken line indicating maximum posterior extension found in any specimen. Fig. 6, Lateral view. Fig. 7, Lateral view, with seminal duct expanded and open. Fig. 8, Dorsal view.

***Paracapnia angulata*, n. sp.**

Capnia vernalis, Needham and Claassen, 1925, *The Plecoptera or stoneflies of America North of Mexico*, pp. 356-7, 2 questionable figs. of ♂♀ (in part?; not Newport, 1848).

Capnia opis, Ricker, 1938, *Trans. Roy. Canad. Inst.*, vol. 22, pt. 1, no. 47, pp. 134-5 (in part?; not Newman, 1839).

Capnia opis, Frison, 1942, *Bul. Illinois Nat. Hist. Survey* 22(2): 264-5, figs. of ♂♀ good (collection data in part; not Newman, 1839).

Male.—A general description of this species would be superfluous because it is distinguishable from *P. opis* only by the supraanal process of the male. Figures 1-8 show ventral, lateral, and dorsal views of this process in comparison with the same of *P. opis*. Differences in the ventral view have been noted in the discussion of the lectotype of *P. opis*. In a lateral view of *P. angulata* both the inner and outer margins are angled at the base (Fig. 2). The inner margin may be as acutely angled as shown in the drawing or may approach a right angle, but it is never evenly curved as in *P. opis*. The supraanal process of *P. angulata* is shorter than that of *P. opis* and is also the thicker in either lateral or dorsal view. *P. angulata* has a single, usually conspicuous, bulge in both lateral and dorsal views, whereas *P. opis* is nearly uniform in width in lateral view and shows two slight enlargements in dorsal view. The appearance of the apical part of the supraanal process depends somewhat on the seminal duct which may be found in various stages of expansion in different specimens.

Most of the *P. angulata* males that I have studied are somewhat brachypterous, whereas in *P. opis* I have found no brachypterous males. Ricker, however, reported the wings of the lectotype of *opsis*, which are now lost, to be brachypterous. Thus, though brachyptery may be more common in *P. angulata*, it is present in *P. opis* on occasion.

Female.—Although the two species of *Paracapnia* are sympatric, they have not been taken together at one stream. Therefore, even though the females of the two species are indistinguishable, it seems advisable to designate specimens taken in association with identifiable males as types.

Types.—*Holotype* male, *allotype* female, Pelham, Mass., 23 Mar. 1938 (J. F. Hanson). *Paratopotypes*, 18♂♂ 11♀♀. *Paratypes*, all from Massachusetts: 2♂♂, Sunderland, 30 Mar. 1937 (J. F. Hanson); 1♂, Paradise Trail, Sunderland, 19 Mar. 1938 (JFH); 2♂♂, Ware, 23 Mar. 1938 (JFH); Westbrook, 1♂ on 18 Feb. 1937,

1♂ on 29 Mar. 1937, 3♂♂ on 4 Apr. 1937, 2♂♂ 1♀ on 14 Apr. 1937, 1♂ 1♀ on 9 Feb. 1938 (JFH); 4♂♂ 1♀, Belchertown, 23 Mar. 1938 (JFH); E. Amherst, 1♂ on 6 Apr. 1937, 1♂ on 24 Apr. 1938 (JFH); Medford, 2♂♂ 1♀ on 29 Mar. 1937 (L. M. Bartlett), 3♂♂ 34♀♀ on 1 Apr. 1938 (LMB).

KEY TO MALES OF PARACAPNIA

Supraanal process of male angulate at base, 0.40 to 0.50 mm. long. *P. angulata*
 Supraanal process not angulate but curved at base, thinner than that of the above species, 0.55 to 0.60 mm. long. *P. opis*

ACKNOWLEDGEMENTS

I am indebted to the staff of the Pitt Rivers Museum at Oxford for making available facilities and equipment for the study of the type of *Paracapnia opis* and to Dr. Edward Coher for critically reading and correcting the manuscript of this article.

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